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India, Sustainable Development, And The Global Commons

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The preceding essay illustrates the concept of sustainable development very cogently by applying it to India and explores some of its keys dimensions by analyzing trends in Indian economic and non-economic data. Also important is the observation that sustainability needs to be practiced at many levels and across many sectors and pollution categories to be effective. And significantly the nature of the pollution created by the poor is fundamentally different than the pollution created by the rich. Finally, we are left with a number of benefit and cost metrics to consider, but no explicit suggestion that these should all be valued and aggregated to guide policy. This probably reflects both a lack of the necessary data to do so and an understandable hesitancy to reduce policy to a single dimension.

The concept of sustainable development is extended to the global level where global commons problems like climate change, ocean pollution and species extinction must be addressed. Economic development may be

sustainable in every country, but not at the global scale if there are global commons issues. At this level a large rapidly developing country like India is both a source of potential problems and necessarily a part of almost any potential solution. The interactions between India and the rest of the world on climate change raises a number of important questions: (1) how many greenhouse gases will India emit in the future, (2) what factors will this emissions level depend on, (3) given India's emissions and those expected for other countries what expectations might the international community have regarding India's ability and willingness to control greenhouse emissions in the future.

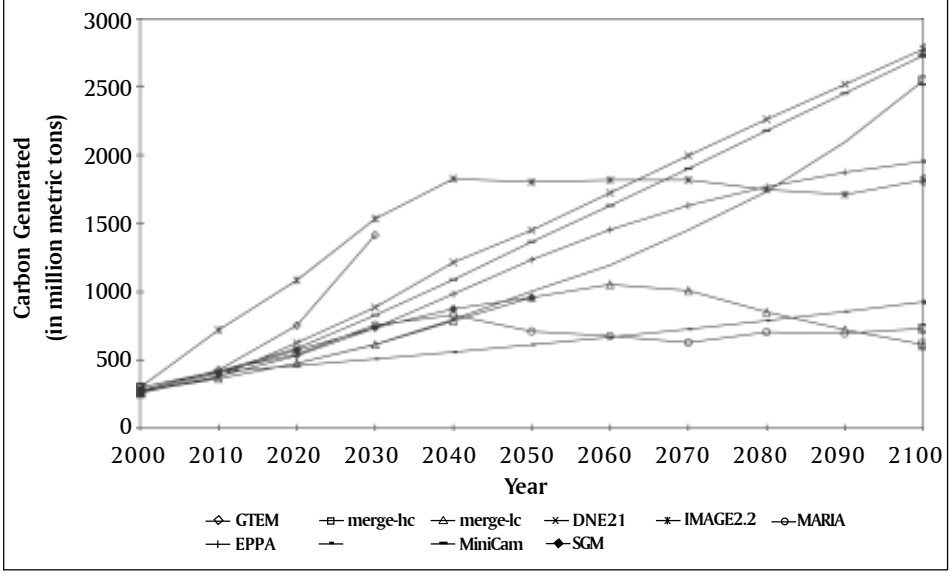
At the global level the direct sustainable development issue is the contribution India makes to the global greenhouse gas emissions. Equally important though are the implications of efforts towards sustainable development in India on green house gas emissions from India. This is both a forecasting/projections issue and a potential opportunity for action by the international community. Although the extent to which efforts towards sustainable development in India will reduce greenhouse gas emissions from it, the strong linkages between air and water pollution and greenhouse gas emissions make it extremely likely that they GHG emissions will be lower if development proceeds sustainably. Thus, it is highly likely that the international community has both the argument that India should reduce GHG emissions for the global good, but also for its own good even beyond what it gains in reduced climate change impacts.

In this section we look at some recent projections of future greenhouse gas emissions by India with and without a global agreement to limit them, and an assessment of recent attempts to model the Indian economy.

India and Global Greenhouse Gas Emissions

In a recent study the Energy Modeling Forum looked at the role of technology in climate policy. All the models in this study were global in scope, but many of them including India as is own region. Projections of Reference case carbon emissions for India are shown in Figure 1, with the range of emissions projections ranging from 459 million metric tons to 753 million metric tons in 2020, ranging from 613 million metric tons to 1451 million metric tons in 2050, and ranging from 614 million metric tons to 2728 million metric tons in 2100. The left

Figure 1: Reference Case Carbon Emissions Projections for India



hand side of Table 1 shows the percentage of global emissions coming from India in the global total projected by each of the models. This range suggests a large range of opinions about how the Indian economy might develop and a substantial part of this range may be due to differences in the sustainability of that growth.

Table 1. India Carbon emissions as Percentage of World Total

	Reference Scenario				550 ppmv Scenario		
Model	**2000**	**2020**	**2050**	**2100**	**2020**	**2050**	**2100**
GTEM	4%	7%			7%		
merge-hc	4%	5%	7%	10%	5%	6%	6%
merge-lc	4%	5%	7%	8%	5%	6%	6%
DNE21	4%	7%	10%	12%	7%	11%	20%
IMAGE2.2	4%	9%	16%	18%	9%	14%	17%
MARIA	4%	5%	5%	5%	5%	5%	3%
EPPA	4%	6%	9%	9%	6%	8%	9%
AIM	4%	5%	5%	5%	5%	5%	5%
MiniCam	4%	6%	10%	14%	6%	9%	10%
SGM	4%	6%	6%		6%	6%	

As shown in Figure 2 part of this differences results from different assumptions about the rate of growth of Indian GDP. Far more striking are the differences in projections of carbon emissions per unit of GDP shown in Figure 3. These

Figure 2: Reference Case Projects of GDP of India

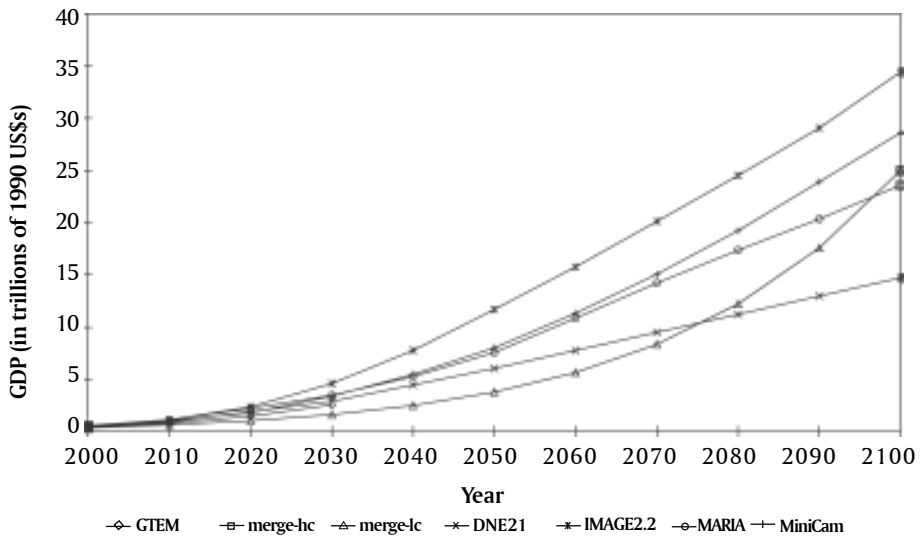
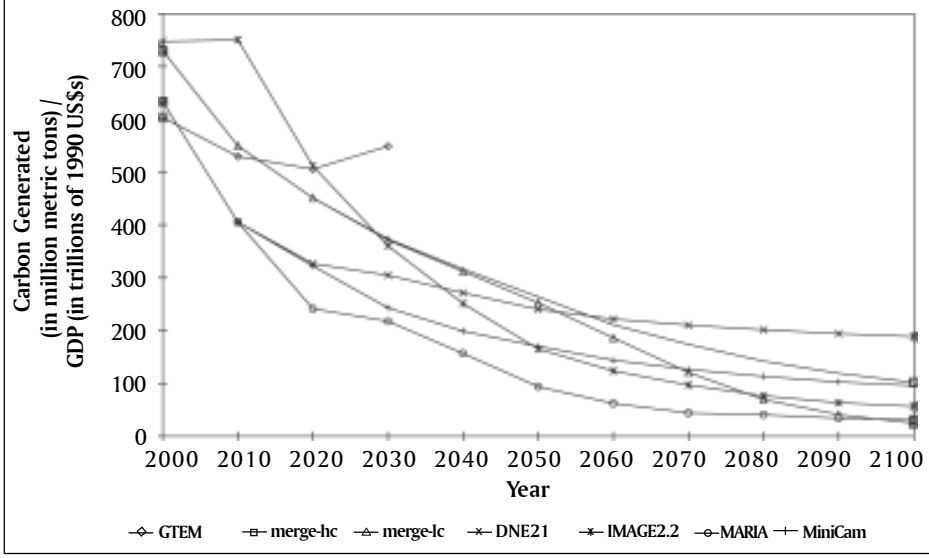


Figure 3: Reference Case Carbon Emission Projections for India



differences reflect difference in both projections of the structure of the Indian economy and in which energy technologies get adopted. The models that project much lower carbon to GDP ratios are likely to be projecting more sustainable development than those that project higher ones.

Another EMF 19 scenario considered stabilization of CO2 in atmosphere at 550 part per million by volume. In this study rules for allocated the burden of meeting this concentration target were not specified so the implementation of the scenario was generally accomplished by imposing a global carbon tax. Nonetheless it is interesting to look at how much of the global emissions reductions would be expected to occur in India for according to the various models. Figure 4 shows the projections of carbon emissions from India for that case for each model, while Figure 5 shows the reduction in carbon emissions from India required in this case for each model relative to each its reference case. Projections of carbon emissions for India for this case range from 387 million metric tons to 1013 million metric tons (versus 459 million metric tons to 753 million metric tons in the Reference Case) in 2020, from 374 million metric tons to 1193 million metric tons (versus 613 million metric tons to 1451 million metric tons in the Reference Case) in 2050, and from 242 million metric tons to 1051 million metric tons (versus 614 million metric tons to 2728 million metric tons in 2100 in the Reference Case). The carbon taxes required to induce these reductions are shown in Figure 6. These range from $4 to $40 per metric ton in 2020 (in 2004 US dollars), $56 to $181 per metric ton in 2050, and $165 to $241 per metric ton in 2100.

The right hand side of Table 1 shows the share of global carbon emissions projected to come from India in each models implementation of the 550 ppmv scenario as long as the corresponding carbon tax projections. Obviously the lower India's reference case emissions turn out to be the easier it will be to implement the stabilization policy. Moreover, models that project low reference carbon emissions for India also project low reference emissions in the Rest of the World, especially in other developing countries. This suggests the possibility that there may be systematic biases in some of the models relating to how the basic elements of economic growth, energy use and carbon emissions are input and specified in them. It is tempting to conclude exactly what that bias might be and which

Figure 4: Projected Carbon Emisions from India in the 550 ppmv Case

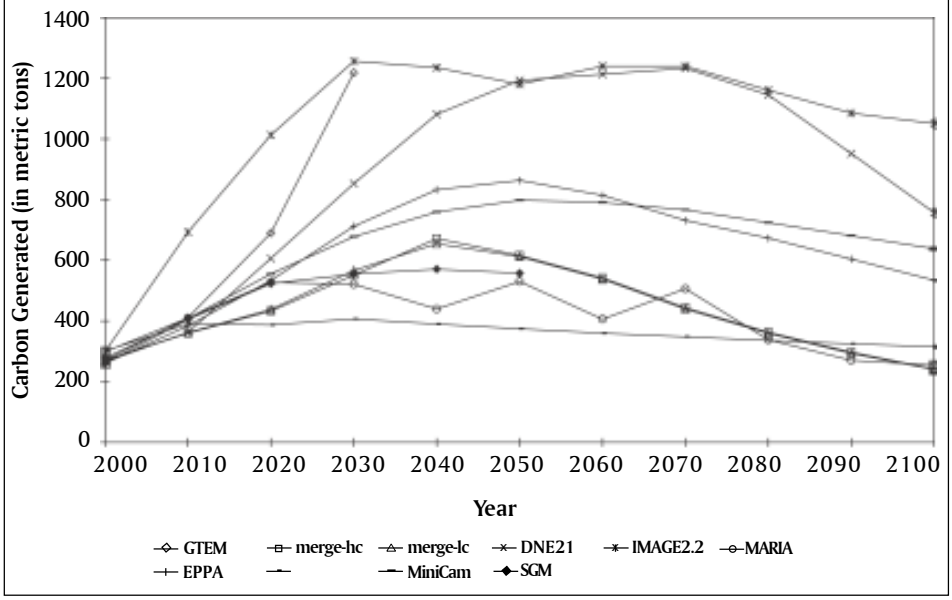


Figure 5: Reduction in Indian Carbon Emissions From Model's Reference to Its 550 ppmv Case

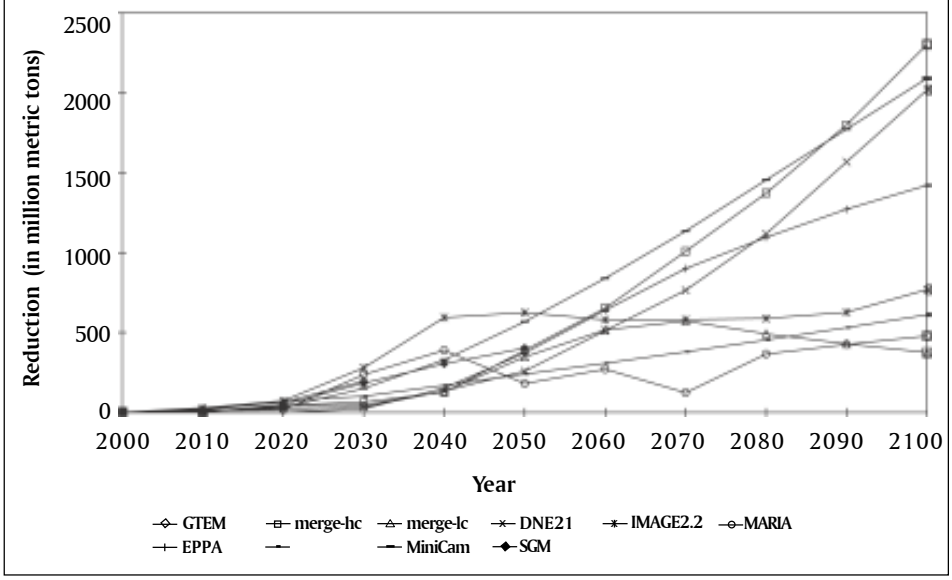
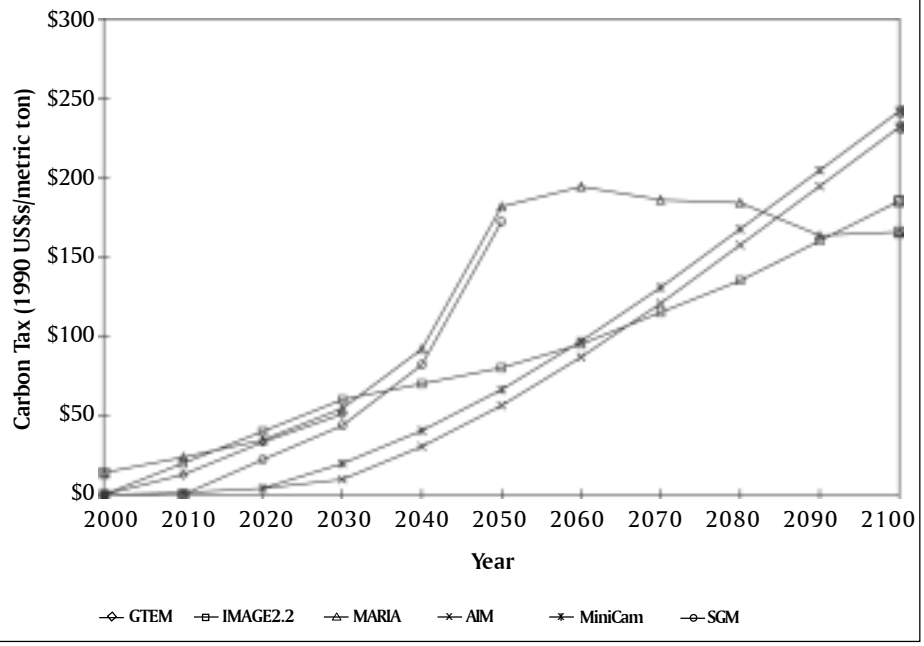


Figure 6: Carbon Tax Required to Reduce Carbon Emissions from Reference Case Levels to Levels that lead to A CO_2 Concentration of 550 ppmv



models have it, but the truth is probably just that significant differences are observed and need to be better understood because they appear to be important for understanding sustainability at both the national and global level. The next section examines the current set of global energy-economy-environment models from the perspective of different participants in the global economy/ecosystem.

Global Modeling and the World Community

Modelers in the US, the EU, and Japan have different perspectives on the state of global modeling, but these pale in comparison to the differences between those observed in developed and developing countries. This is especially true where the environment is concerned and even more so where global climate change is concerned. To citizens of the South the models often look like nothing more than an elaborate spoke screen created to blame them for a problem caused by the citizens of the "North." That the southerners might aspire to grow in a manner already demonstrated by the northerners seems to be very much on the minds of both sides.

One reason for the uneasiness about global models by those from developing countries is that they either see there countries as not explicitly represented in the models or represented so poorly so as to be barely recognizable. Some of the dimensions of these differences in perspectives are summarized in Table 2. This table was presented at the 2000 annual meeting of the American Economics Association to highlight some of the difficulties in using model and communicating model results internationally.

Table 2: A Revealed Preference Study of Climate Change Policy Analyses

Class of World Citizen	**Typical OECD (AEA Member?) Analysis**	**ROW Analysis**
2 Billion People Without Markets	What 2 Billion People?	High Priority: Reduce Their Vulnerability
2 Billion In or Near Poverty with Fragile	They Don't Count for Much!	High Priority: Reduce Their Markets Vulnerability
2 Billion Potential Decaf Latté Drinkers	Half Are Stuck In Transition, But the Rest We Can Help	They Can Take Care of Themselves

The table breaks the world up into three classes of global citizens – citizens of developed countries, citizens of developing countries with access to markets and citizens of developing countries without access to markets. The middle and right hand columns of the table show how OECD analysts and Rest of World analysts often implicitly treat the three groups in their analyses. The OECD analysts tend not to focus at all on people without markets, to value impacts in low income countries only in so far as their incomes are affected which by definition if not very much in absolute terms. These analysts focus most of their attention on trade-offs between energy and environmental goals in the developed countries. The Rest of World analysts typically figure that people and developing countries have the resources and options to make these kinds of tradeoffs and focus instead on the needs and opportunities of the other 4-5 Billion inhabitants of the world who are the most vulnerable.

The (somewhat tongue and cheek) descriptions of these two different perspectives does explain some of the key North South sensitivities underlying

the international climate change policy debate, it actually opens up a whole new frontier for the analytical community – to craft new tools to work on the problems facing people in developing countries rather than transposing the problems faced by developed countries to them. This undoubtedly includes much more detailed and difficult work on formulating and analyzing sustainable development issues than has been accomplished to date. New data, model formulations, insights and results need to be produced at a level that can help decision makers in developing countries decide what to do.

Recommendations

The proceeding discussion has several implications for policy analysis and for policy development. Sustainability includes externalities like poverty and political stability that are not commonly factored into quantitative policy analyses. Some environmental externalities can now be quantified with some confidence, but even then it is unusual for more than one or two to be considered simultaneously. Other externalities are difficult to measure (e.g., poverty and stability), but it is important to reflect them in some way in making baseline projections and conducting policy analysis. To ignore their importance to decision makers whose behavior is being represented can lead to misleading results or at least over-confidence in results from analyses that frame the policy process too narrowly. This is not to say that conventional analytical techniques are less useful or themselves misleading. On the contrary, analysis stands to play a more significant role precisely because the situation being analyzed is more complex and uncertain than originally imagined. What is necessary is a willingness to apply the old tools to new problems within a broader and more nuanced conception of the problem of development at many levels. The challenges are substantial, but the potential payoffs are commensurately impressive.

Paralleling the recommendations for analysis are those for policy. Once the elements of sustainable development are acknowledged a broader framework for assessing and implement policy options is required. Besides raising energy prices to world levels and internalizing externalities where possible, alternative development pathways can be considered systematically in search of policies that yield improvements in many dimensions and negative impacts in few. Quantification and integration may be possible, but may not be necessary. Comprehensiveness and consistency are probably more important.

The international community can play a role in encouraging sustainable development at home and abroad, especially in developing countries. By providing information, analysis, technical assistance, technology, and institutional support, sustainable development can be encouraged. And sustainable development at the country level can reduce pressure on the global commons to the benefit of all nations.

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